



**Networking Business Line
FISCAL YEAR 2007 – 2011 PLAN**

Executive Summary

This Business Plan describes the services, organization, planning, and objectives of the Networking Business Line in the Department of Energy's (DOE) Working Capital Fund (WCF). The Networking Business Line consists of two major enterprise activities: (I) Headquarters Network Infrastructure and (II) Wide Area Network (DOEnet) Infrastructure (Department-wide).

This plan is organized according to Balanced Scorecard (BSC) planning concepts and builds upon the trends and lessons learned during the WCF's first years of operation, and previous assistance from an Information Technology (IT) planning consultant, to meet DOE and the Office of the Chief Information Officer (OCIO) strategic goals and the objectives of each business line. It describes performance objectives and plans aimed at better meeting the current and anticipated out-year requirements of our customers over the life of this Plan.

The operational costs and capital investment impact of this plan are described in the **Financial Analysis** section on page 17.

Mission:

To provide timely, reliable, and consistent networking services to DOE HQ organizations located at the various Washington D.C. metropolitan locations and DOE-wide via the Department's wide area network.

Vision:

Provide cost-effective state-of-the-art networking services that meet DOE customers needs and exceeds their expectations.

The Networking Business Line provides:

This business line provides network connectivity service for approximately 8,000 users across the DOE HQ facilities in Washington, D.C. and in Germantown, Maryland, enabling 100+ organizational LAN segments to interoperate across the MAN which spans 13+ offices in the Washington D.C. metropolitan area. In addition, the LAN interfaces with the Department's WAN providing service and communications links to 40 + field sites, other government agencies and public/private business partners.

The business line also provides access to the Internet and World Wide Web, Electronic Mail, and Corporate and Program Office applications through the network backbone infrastructure.

It includes services such as:

- Installations, moves, and changes of Network connection and infrastructure components
- Installation and management of the Network circuits connecting the DOE "campus" facilities
- Domain Name Service (DNS) and IP address management and maintenance
- Technical personnel to install, manage, and maintain the network infrastructure
- Hardware and software maintenance for all network infrastructure components

FY 2006 Achievements

Overall performance for fiscal year 2006 exceeded targets for the network business line. Significant accomplishments are included to demonstrate the continuing improvements being made in all areas of this business line, as well as the on going efforts to acquire and implement more capable measurement tools. We continue to strive to refine our performance goals and improve the tools used to measure our achievement.

Summary Performance vs. Objectives

Business Line	SLA Objective Availability	Attainment
HQ Network Infrastructure	98.0% (Per Task Order)	99.98%
Internet Service	99.0% (Per Task Order)	99.99%
DOEnet Circuits	95.0% (Per FTS2001)	99.96%

FY 2006 Accomplishments by Business Line:

Daily, Weekly and Monthly HQ Network Performance Reports are produced in support of this business line. Tivoli NetView and Concord's E-Health are used to collect and report the network statistics. These reports are generated for SLA purposes and customer comments are welcomed on improving their usefulness. The reports are posted on the CIO-Ops Web Site at: http://cio-ops.doe.gov/standup/stu_reports.cfm.

Network Management Accomplishments

- Network Operations monitored all OCIO-maintained Network Devices and Network Services, 24 hours/day X 7 days a week, utilizing Tivoli NetView, Concord, Attention! Notification System, CiscoWorks, and open source network management tools.
- Successfully completed project and program plans to support the planning phase of the Network Modernization, DOEnet WAN Firewall Implementation and Network Segmentation projects.
- Completed IPv6-readiness inventories and the initial data calls for both the HQ Site Network and WAN; to include all routers, switches, and supporting cyber security appliances.
- Developed and maintained the Enterprise Network 5-Year Plan and Architecture
- Completed all documentation requirements in support of the Network Certification & Accreditation (C&A).
- Manage the DOE HQ Site Network and DOE Wide Area Network in accordance with established configuration management practices to provide a reliable operational environment and to avoid adversely affecting the operation and security controls for all authorized, connected production information systems.
- Expanded the skill set of CSC Network Operations (Help Desk) to provide Tier II level support.

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- Provided VPN remote access for DOE HQ network user community at a 99.97% reliability rate.

Network Infrastructure Accomplishments:

- Successfully provided network project planning and implementation activities to support the relocation of approximately 15 program offices for the first three phases of the Departments Sprinkler Head Project to include customer requirements, configuration design and implementation activities, and ongoing customer support.
- Coordinated and decommissioned the NNSA SonicWall VPN devices at DOE HQ, Nevada, and Albuquerque as a direct result of the implementation of AES-256 encryption on the wide area network (DOEnet).
- Implemented a new TACACS & RADIUS package, Radiator, an open source COTS application that supports integration with 2-factor authentication solutions and was tested successfully via RADIUS-proxy with the RSA ACE server deployed at DOE HQ. Radiator provides a number of necessary AAA functions and is compatible with IEEE 802.1x.
- Developed and successfully implemented a strategy for removing all IPX legacy traffic from the DOE networks (LAN/MAN/WAN) mitigating the risks presented by the legacy protocol, streamlining network infrastructure configurations and reducing duplicate client/server negotiations.
- Provided significant engineering support ensuring the smooth and orderly transition of the DOECOE user environment into the DOE OCIO managed network.
- Established a site-to-site VPN connection to support the Strategic Petroleum Reserve Office Emergency Operations Center, Stennis, Mississippi.
- The network operations and network security teams deployed and maintained an expanded set of IP and DNS black lists identified as associated with specific cyber attacks directed at the Department. The lists are periodically expanded to include known spyware, malware, and other malicious sites on the Internet that present a significant threat to DOE end-users and which are not required for DOE business. Input sources for additions to the list include CIAC, SANS, sites identified based on anecdotal DOE HQ malware encounters, and other Internet sources.
- Deployed caching DNS servers and created BIND “views” to further harden the DNS infrastructure at DOE HQ implemented in support of operating a more efficiently managed split-split DNS architecture.
- Replaced the Network Time Protocol (NTP) Sun Solaris server with a CentOS Linux platform and set up a COTS GPS time-tracking appliance to provide DOE HQ with a Stratum-1 network time source. NTP is a network infrastructure service for all DOEnet hosts (both WAN and HQ). All DOEnet systems can receive NTP time from: time.doe.gov.
- Provided network engineering support to WAPA and BPA customers for their 8th Floor, Forrestal Offices. Architected two similar isolated point-to-point DOEnet paths to their main sites (WAPA-Lakeland, CO, and BPA-Portland, OR, via Richland, WA).
- Upgraded the Forrestal ISP connection bandwidth and hardware.
- Upgraded connectivity in support of Security's Guest Registration Project installing Cisco switches supporting the GRS terminals.

Anti-Virus and Decontamination Accomplishments:

- 999,870 virus encounters, including 5 incidents, were addressed.
- 18 decontamination incidents involving 86 systems were addressed.
- 5,158 systems, including 250 servers and 233 VPN users were managed with McAfee ePolicy Orchestrator (ePO) anti-virus architecture.

DOEnet (WAN) Accomplishments

- Successfully upgraded DOEnet from ATM technology to MPLS/IP. The new network provides DOE with a FIPS 140-2 AES encrypted full-mesh nationwide backbone built upon Cisco 3845 routers with hardware-accelerated IPSEC encryption and compression. All DOE business communications routed over the WAN pass through IPSEC tunnels configured using Dynamic Multipoint VPN. Virtual Routing is enabled to allow multiple communities to be isolated using overlay networks as required to meet Program Office and Field Site requirements. During the upgrade project successfully sustained connectivity between the MPLS/IP network and legacy ATM sites via an ATM-to-IP bridge.
- Relocated the DOEnet WAN uplink at DOE HQ from Forrestal to Germantown.
- Provided 24/7 monitoring and support on all DOEnet WAN circuits and site connectivity.
- Successfully implemented and continue to support two Interconnection Security Agreements supporting two off-net program offices that required unique connectivity to DOEnet.
- Established new full network connections for the Washington D.C. Navy Yard and Yucca Mountain Site Office, providing other network service and technical support.
- Successfully updated the DOEnet router IOS firmware and configurations. These actions were taken to address vulnerabilities and improve troubleshooting capabilities.
- Deployed and tested Juniper WAN accelerator appliances at three locations on the WAN. Reports showed a significant improvement in reduced latency and compression of the traffic allowing for additional traffic to traverse the connection.
- Deployed and tested four Visual Networks ASE probes to evaluate the tool for detailed application traffic reporting.

Monthly Performance Metrics for 2006 by Business Line:

DOE HQ Backbone Network Availability:

Month	HQ Backbone Availability
Oct	99.98%
Nov	99.9%
Dec	99.99%
Jan	99.99%
Feb	99.99%
Mar	99.99%
Apr	99.99%
May	99.99%

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Jun	99.97%
Jul	99.99%
Aug	99.97%
Sep	99.96%
Overall Availability	99.98%

Availability is a measure of the reachability (i.e. connectivity) of all DOE HQ router and switch devices over time. Each device carries a weighted factor based of number of end users supported relative to total users at the HQ site. We continue to refine our measurement capability and will, over time be able to provide more granular and customer specific data. Availability does not attempt to measure or consider anything other than network infrastructure devices (i.e. server and/or application availability are not in the calculation). HQ Network Performance Reports (Daily, Weekly, and Monthly) are posted on the CIO-Ops Web Site at the following URL:

http://cio-ops.doe.gov/standup/stu_reports.cfm

Internet Service Availability:

Month	Availability
Oct	100%
Nov	100%
Dec	100%
Jan	100%
Feb	100%
Mar	100%
Apr	100%
May	100%
Jun	99.99%
Jul	100%
Aug	100%
Sep	100%
Overall	99.99%

DOEnet Circuit Availability:

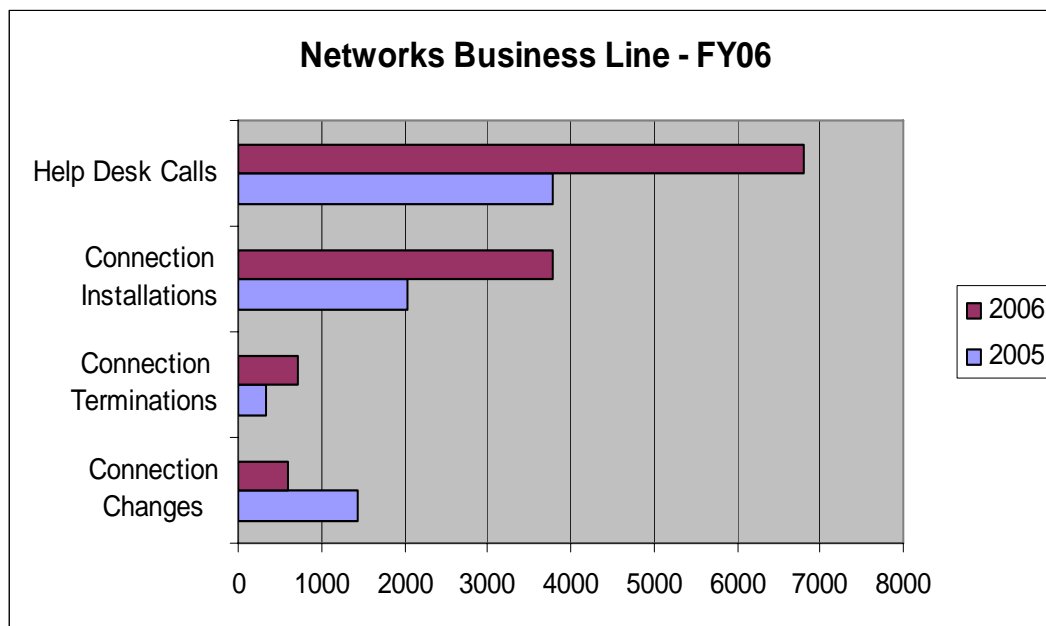
Month	Availability
Oct	99.98%
Nov	99.98%
Dec	99.97%
Jan	99.99%
Feb	99.89%
Mar	99.95%
Apr	99.98%
May	99.97%
Jun	99.97%

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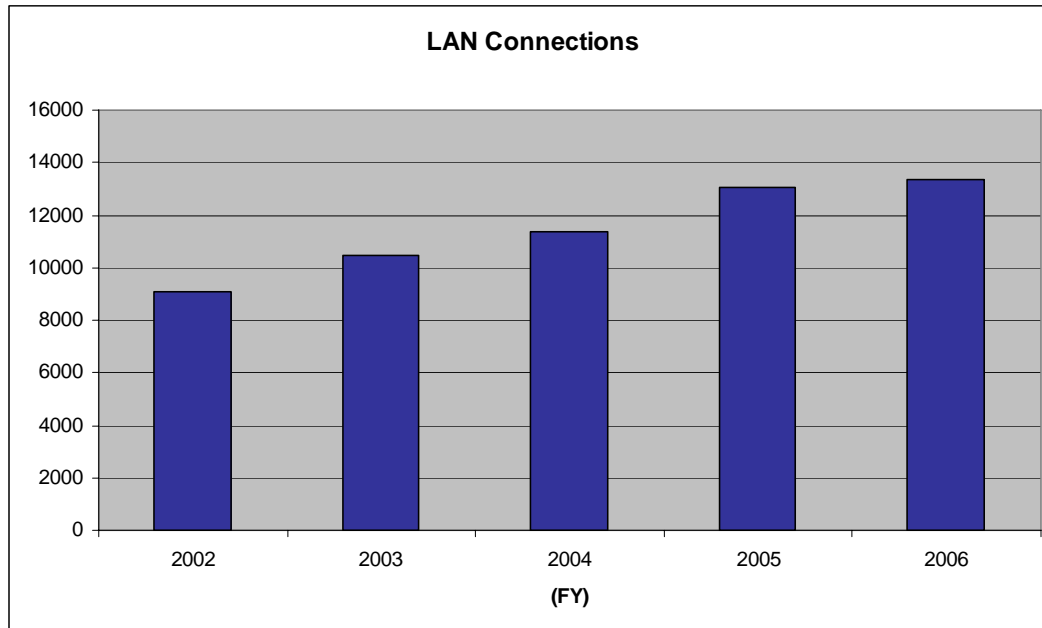
Jul	99.87%
Aug	99.97%
Sep	99.98%
Overall	99.96%

Customer satisfaction is measured by: personal contact with critical customers, help desk feedback on completed trouble tickets, and by direct feedback from users in the form of complaints. Customer satisfaction, measured by these methods, is judged to be very high.

During FY 2006, the Network business line staff responded to the following service calls:



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Network connections have increased significantly over the past couple of years largely due to the implementation of various e-government initiatives within DOE. This has caused a significant number of new connections for file servers, web servers and other devices in support of e-government. The increase in help desk calls is a result of a continuing effort to capture all support activities in a help desk ticket, as well as the expansion of VPN support hours to 24 x 7. The number of VPN users has continued to grow over the past year.

Introduction

The purpose of the Networking Business Lines Plan is to provide the guidelines through which the OCIO WCF services are selected, planned, executed, and measured in support of IM-60's (formerly IM-40) business. The business of IM-60 is to provide a secure, reliable IT infrastructure and other core IT services to the DOE HQ facilities, the business functions within it, and DOE wide (for DOEnet).

IM-60 has established the following goals & objectives to improve the planning and delivery of WCF IT services to its customers:

- Create and maintain a clear networking line Business Plan.
- Enable the Department's IT business vision through the effective use of these IT services, which increases the customer's efficiency and effectiveness.
- Become a better business partner with the user community.
- Provide a continuously stable networking infrastructure environment that meets the needs of DOE HQ's end-users.
- Make the necessary information available to the DOE HQ's end-user community to enable them to clearly understand IT operations.

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- Develop an IT organization that can focus on these "core" service areas (i.e., competencies) needed to support the DOE HQ's business; outsource some or all of these functions, where appropriate.
- Provide visibility to IM-60 efforts towards streamlining IT operations.

Business Line management reviews business goals and results through communication with customers, vendors, and contractors. An active employee training policy is pursued subject to the limited funding available for training, in addition to constant self-assessment and benchmarking, in order to keep the organization current on industry changes and out-year directions.

Planning Process: Objectives for improving business line performance are in line with those of the OCIO, the Deputy Secretary, the WCF, and support the Department's strategic objectives in Corporate Management. OCIO objectives are to provide DOE WCF customers with current technology services and products at a fair cost to ensure customers receive value and quality services and corresponding management services. The WCF objectives are to improve the efficiency of services within the WCF and to provide accurate full-cost budgets. The business line reports its progress towards these balanced scorecard objectives to the WCF Fund Manager on a quarterly and annual basis. These objectives and the performance goals and strategies are updated at appropriate times.

Current pricing policies have been implemented that are consistent with and based on the guidelines provided in the Working Capital Fund Guide to Services and Procedures 2000 (the Blue Book).

External regulation and partnerships: Partnership relationships are formed with various contractors to help provide these services to the customers. Enforceable service level agreements are developed that apply to these partnerships in order to promote continuous improvement in the delivery of services to our customers. Through the DOE Annual Information Technology Conference (AITC), DOE Computer Security Conference, and DOE Records Management Conference, we establish and maintain relationships with our DOE Field and Laboratory colleagues as well as our colleagues in other government agencies and private sector businesses. Additionally, the Department's Chief Information Officer is actively involved with the Federal CIO Council, the principal interagency forum to improve agency practices for the management of information technology. We look to our partners and colleagues for information on emerging trends in customer service and technology and for best practices that we can adapt to our provisioning of networking services. Our equipment and supply vendors and skilled onsite engineers support us by providing quality products and prompt delivery, installation, and maintenance. They also help to keep us informed of new technologies and practices that may benefit our customers.

Resources and capabilities of the organization: Federal and contractor staffs have extensive experience in providing networking services. Our line support staff assists customers in the selection of appropriate, cost effective equipment or services by performing an assessment or as necessary a requirements analysis.

Needs and capabilities of customers: Assistance and coordination is provided to our customers

on several levels – with the overall program organizations senior management, with the program office CIO's and with the individual staff.

Balance Score Card

Balance Score Card Objectives:

- **Customers:** Provide customers with timely and consistent services while maintaining as low as possible costs to the customers.
- **Financials:** Improve efficiency and ensure full cost recovery of ongoing daily costs as well as needed periodic capital improvements.
- **Internal Processes:** Streamline internal processes.
- **Learning and Growth:** Enhance the effectiveness, knowledge, and satisfaction of the Lines' employees.

Customer Objective: Provide customers with reliable services

The most important need for individual customers is secure and reliable networking services. For example, our customers want to be able use the HQ Site Network and DOE net to use email services, access corporate data, to access the Internet; and to have timely responses to related problems and performance issues.

Programmatic customers want these IT services that enable them to accomplish their mission at a reasonable price. Program organization managers make the tradeoff between service levels and related costs, where appropriate. By providing these WCF IT services, we help to promote efficient, effective, and economical operation of DOE HQ.

Performance Goal	Performance Standard
Measure Customer Satisfaction by surveys, or direct requests for input on specific services individuals received. Make changes where needed.	Achieve an overall customer satisfaction rating of 95% or higher each year.
Continuously evaluate costs of services to achieve reductions where possible or request rate increases as necessary	Apprise the DOE WCF Board at least annually of the status of ongoing efforts to achieve rate reductions where possible, and/or those situations where costs have increased and the only viable option other than degradation of service is to increase charges.

Baseline:

- Customer satisfaction is measured via surveys by conducting at a minimum an annual sampling of organizations the OCIO supports, discussion with Program Office CIO's, their staff, and others. Additionally, direct customer satisfaction is measure in follow-up to identified issues and related support. A customer services survey was completed during the

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2nd Quarter of 2007. However, the results were not available at the time of this report. This information will be shared in future WCF reports.

- Costs are continuously reviewed and are affirmed at least annually.
- Communications are key to supporting customers nationwide. To that extent the OCIO strives to keep customers informed via quarterly video teleconferences, DOEnet “Alert” e-mails, and participation in annual conferences that promote customer face-to-face interactions.

DOEnet process elements are periodically reviewed by the Office of the Associate CIO for Operations to identify opportunities to make service improvements and maximize operating efficiencies. Two independent groups with broad customer representation, the IT Working Group (chartered by the WCF Executive Board) and the Associate CIO Council, exercise evaluation and advisory roles in partnership with CIO Business Line management and operating staff.

Strategies for Improving Customer Satisfaction	Fiscal Year				
	2007	2008	2009	2010	2011
Measure customer satisfaction	x	x	x	x	x
Continuously evaluate services	x	x	x	x	x
Continue partnering efforts through the IT Working Group and Assoc CIO Council	x	x	x	x	x

Financial Objective: Improve efficiencies and ensure full cost recovery based upon periodic assessments of current costs.

The Working Capital Fund has been successful in its goal of improving customer efficiencies that result from the consumption decisions of program offices. In order to continue providing our customers with competitively priced services, we will review our costs, especially fixed business costs. Fix costs include depreciation, support contracts costs and the cost of contracts from commercial organizations for basic telephone and networking services that are only available from commercial sources. To help ensure that costs and charges are accurate and reasonable, we will periodically have these items reviewed by an outside independent and objective group and/or survey other government agencies for comparison of services and costs. Additionally, standardization and centralization of the shared enterprise wide distributed computing environment should also help to ensure reasonable costs and charges with the continued rollout of the DOE e-Gov initiatives. The costs will also continue to be monitored internally by IM as has been the case since the inception of the fund to help ensure continued value for our customers.

Performance Goal	Performance Standard
Review costs with the assistance of outside organizations with appropriate skills.	Charge customers appropriately for the services they receive.

Baseline: The OCIO was able to successfully upgrade the delivery of network services to MPLS/IP technology and upgrade all network hardware within the annual operating budget by working with the Carrier to deliver these services in a cost effective manner during FY 2006.

- Costs have been reduced in some areas of the networking business line since the inception of the fund for this line.
- Data continues to be reviewed at least quarterly in association with the Quarterly Financial Reviews.

Strategies for reviewing costs	Fiscal Year				
	2007	2008	2009	2010	2011
Review costs with outside assistance	x				
Review costs with internal IM resources		x	x	x	x

Internal Process Objective: Streamline internal processes.

The majority of effort for the network business is building and maintaining information technology infrastructure. A complete and scheduled discussion of these efforts is located at the end of this plan. Also, problem solving and risk management are processes that are critical to this business and that discussion follows:

The Networking Business Line is continuously developing its staff's ability to identify and solve problems affecting the business lines, and to create the most dynamic, efficient business possible. The greatest opportunity for learning and growth is achieved through periodic meetings between the Business Line Managers and their Federal and contracted staff. These staff meetings focus on eliminating operational barriers to the business line and produce many of the ideas for performing self-assessments. In addition to these meetings, informal meetings analyzing the business line occur on a regular basis and Federal staff generate periodic weekly reports highlighting important issues that may affect the business line as well as potential solutions.

When a significant or recurring problem is identified, a self assessment is first conducted against performance metrics in the problem area (e.g., number of help desk calls resolved by Tier 1 personnel). When the root cause(s) of the problem is identified efforts are initiated quickly to efficiently solve it. Tracking systems are utilized to track problems until they are solved, and summary reports are reviewed at least quarterly to help ensure that the same problem does not reoccur.

Performance Goal	Performance Standard
Eliminate problems as quickly as possible.	Conduct periodic reviews and report results within IM or outside IM as appropriate.

Baseline:

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- Problems have been resolved that are inherent to running this technology based lines, many of which are the latest software and hardware technology since the inception of these services being in the fund.

Learning and Growth Objective: Enhance the effectiveness, knowledge, and satisfaction of Networking Line employees.

The Networking business line is continuously developing its staff's ability to proactively identify and solve potential problems as well as current problems affecting the business line in order to achieve the highest possible levels of service to our customers. This learning and growth is accomplished with OJT as well as attendance at vendor symposiums and conferences as well as targeted specific training. In addition to these types of training and learning opportunities, weekly staff meetings as well as informal meetings fosters the exchange of knowledge such that all lines benefit.

Baseline:

- Business line staff continue to receive Project Management and COTR training to improve business line management.
- Other employees have received specific technical training targeted to their areas of responsibility.

Strategies for Improving Learning and Growth	Fiscal Year				
	2006	2007	2008	2009	2010
Continue to Re-evaluate Strategy	x	x	x	x	x
Continue to train 20% of employees	x	x	x	x	x

Network Initiatives:

The business line manager will strive to keep the business line services in line with current technology to ensure customers are receiving the best possible service. With the current speed of information technology advancements, it is difficult to accurately predict what is needed in the out years. The initiatives listed below are recommended changes to support known requirements.

The timeline chart represents the planned activities over the course of the five-year plan. These activities are necessary to sustain a networking infrastructure that is consistent with the business needs of the Department. Additionally, they address capabilities driven by e-Government Legislation, life-cycle maintenance (technology refreshment), convergence management, cyber-security requirements, and continuity of operations expectations.

Network Initiatives Timeline

Year 1	Year 2	Year 3	Year 4	Year 5
Refresh 20%	Refresh 20%	Refresh 20%	Refresh 20%	Refresh 20%
C&A Baselines DHCP	RADIUS IPv6			
802.11 Pilot	802.11 Guest Net 802.1x Guest Net	Unified Wired/less		Gig to the Desktop
MAN – HQ FW	MAN – IPSEC	MAN – Site FW	10 Gigabit Core MPLS	
WAN Site Firewalls	WAN Traffic Inspect			
VoIP Gateway Pilot	VoIP Broad Pilot IP Video Bridges	VoIP across WAN	Desktop Video	VoIP across HQ
Internet IPS & FW	802.1x 25% HQ DMZ	802.1x 25% Self-Defending Net	802.1x 25%	802.1x 25%
DR DNS				Active/Active

Infrastructure	LAN	MAN	WAN	Convergence	Cyber Security	COOP
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Year 1 – FY2007

Refresh: Technology refresh/upgrade for the network edge (primarily closet switches). Legacy (non-Cisco, non-VLAN, and/or non-802.1x capable) closet switches will be replaced with switches that provide at least 100 Mbps to the end-user, Gigabit uplinks, support for 802.1Q VLAN configurations and 802.1x authentication. The baseline standard closet switch for all new deployments is the Cisco Catalyst 3560 for individual deployments and the Catalyst 3750 for stacking deployments, both capable of delivering advanced enterprise edge services and Power over Ethernet in preparation for VoIP.

C&A Baselines: Continue to maintain the certification and accreditation of the DOE networks operated by the OCIO. New baseline configuration templates will be used to ensure that all network infrastructure devices are configured using approved standards and security controls are enforced.

DHCP: Transition DOECOE DHCP services at DOE HQ from program office and legacy OCIO systems to operate under a high-availability cluster. DHCP will be supported through the use of OCIO-managed Infoblox appliances deployed to both Germantown and Forrestal. As part of this transition all Active Directory DNS services for DOECOE will be migrated to the Infoblox appliances.

802.11 Pilot: Establish an 802.11 wireless network capability at DOE HQ to support conference rooms and limited user mobility within OCIO-managed space. Wireless connectivity in conference rooms and other areas will be provided to allow mobile users to access the Internet and DOE Remote Access services (e.g. VPN and Citrix) without compromising the cyber security of the HQ Site Network.

MAN HQ FW: Continue to operate the MAN firewalls deployed at Germantown and Forrestal which provide detailed traffic reporting and separate each MAN office (950 & 955 L'Enfant, Landover, Corp270, Cloverleaf, EES, DataTree, Stanley, and Quince Orchard) from the two large facilities. During the course of this year the MAN firewalls at Germantown and Forrestal will receive an initial firewall rule set.

WAN Site Firewalls: Deploy Cisco ASA 5500-series appliances to each field site on DOEnet. These appliances are designed to provide both firewall and IPS functions. During this year the firewalls will be deployed and installed in-line on the WAN uplink at each field site.

VoIP Gateway Pilot: Continue to operate a Voice-over-IP pilot with gateways into the PSTN from DOE HQ allowing calls to be made directly from IP telephones on the HQ Site Network to the PSTN without traversing legacy analog phone switches. The pilot will showcase the benefits of a single cable plant, integration as required with the legacy environment, and all the other benefits of a converged, fully integrated VoIP telephony solution.

Internet FW & IPS: Deploy Cisco ASA 5540 appliances to the Internet perimeter at DOE HQ. The OCIO will replace the current AT&T-managed Checkpoint firewall with an IM-60 managed Cisco firewall cluster.

DR DNS: Deploy two additional DNS servers at DOE HQ in support of DR/COOP exercises conducted by the OCIO Application Hosting Environment. Execute DNS changes and operate separate zones as needed for DR and COOP activities in support of corporate applications brought online at the Sunguard facility.

Year 2 – FY2008

Refresh: Technology refresh/upgrade for the network edge (primarily closet switches). Legacy (non-Cisco, non-VLAN, and/or non-802.1x capable) closet switches will be replaced with switches that provide at least 100 Mbps to the end-user, Gigabit uplinks, support for 802.1Q VLAN configurations and 802.1x authentication. The baseline standard closet switch for all new deployments is the Cisco Catalyst 3560 for individual deployments and the Catalyst 3750 for stacking deployments, both capable of delivering advanced enterprise edge services and Power over Ethernet in preparation for VoIP.

RADIUS: Deploy highly-available centralized RADIUS directory services at DOE HQ to support 802.1x deployments across the network infrastructure. 802.1x enables user authentication prior to granting network access at the edge. RADIUS provides network AAA services (authentication, authorization, and accounting).

IPv6: IPv6 network configurations and addressing will be deployed for systems attached to the HQ Site Network and DOEnet WAN as needed to meet OMB requirements.

802.11 Guest Net & 802.1x Guest Net: Deploy guest and mobile user network access throughout selected areas of DOE HQ buildings through the use of 802.11 and 802.1x technologies. Provide wireless connectivity in conference rooms and other areas where guests and mobile users will benefit from Internet access but are not permitted direct access to the internal HQ Site Network. 802.1x authentication and FIPS 140-2 encryption will be used to ensure only authorized users are permitted access. Additionally, 802.1x will allow conference rooms and other shared spaces to provide wired access to mobile users through the use of Guest VLAN capabilities.

MAN IPSEC: Upgrade the Germantown and Forrestal Metropolitan Area Network routers and the downstream site office routers to enable AES-256 encryption and compression across all data circuits that interconnect DOE HQ buildings.

WAN Traffic Inspection: Enable Netflow traffic accounting and additional firewall and intrusion prevention services on all DOEnet site routers and ASA appliances. Expand the firewall and traffic inspection rule sets to further lockdown the environment. Deploy Cisco MARS at DOE HQ to analyze events from the routers and firewalls on the WAN.

VoIP Broad Pilot: Expand the Voice-over-IP pilot with additional users throughout DOE HQ and begin to deploy Video-over-IP services with the initial deployment of an OCIO-managed IP video bridge and ISDN gateway in continued preparation for a converged network.

HQ DMZ: Deploy Gigabit-capable firewalls and Intrusion Prevention Systems (IPS) to further enhance the cyber security architecture of the HQ Site Network. Current network IDS/IPS systems will be upgraded from 100 Mbps interfaces to support Gigabit connections. Two additional Cisco 6509 Catalyst switches each capable of processing 720 Gbps of traffic will be deployed to establish a full DMZ for outside-accessible servers. Gigabit-capable firewalls will be installed at chokepoints in the network to support high-speed traffic inspection for securing high-value enclaves (to include program office servers and the Application Hosting Environment). Cisco 6500's will be fitted with PIX firewall modules (each capable of 5 Gbps throughput, up to 4 blades per switch).

Year 3 – FY2009

Refresh: Technology refresh/upgrades for the network edge and distribution layers. Cisco Catalyst 6500 distribution and data center switches will be upgraded with new

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supervisor engines to raise backplane capacity from 32 Gbps to 720 Gbps and 1.44 Tbps; 100 Mbps line cards will be replaced with Gigabit line cards. Edge switches will be upgraded to support Gigabit and multi-Gigabit uplinks.

Unified Wired/Wireless: Wireless and wired network access at DOE HQ will be unified to allow end-users to access HQ Site Network internal resources without VPN through both wired and wireless connections. Wireless service modules will be installed in distribution switches to control 802.11 access points in selected areas at DOE HQ to allow authorized mobile users (e.g. laptops) to roam across a unified wired and wireless network using AES-256 encryption and strong authentication when wireless.

MAN Site FW: Deploy firewalls on-site at MAN offices with multiple user communities and/or server resources (e.g. 950 & 955 L'Enfant, Corp270, Cloverleaf, EES) to allow granular access restrictions within each MAN office based on the network segmentation model deployed at Germantown and Forrestal where all servers are separated from desktops, and groups of end-users are segmented based on program office affiliation and business function.

Year 4 – FY2010

Refresh: Technology refresh for the HQ Site Network during this phase will include upgrades to edge switches, distribution switches, and network routers.

10 Gigabit Core & MPLS: Upgrade all core switch interconnections at Germantown and Forrestal from Gigabit Ethernet to 10-Gigabit Ethernet. Upgrade the SONET ring between Germantown and Forrestal to support multi-Gigabit capacity. Deploying additional bandwidth, quality-of-service capabilities, security features and advanced technologies such as MPLS, and new traffic management features will ensure the network can meet increased demands and simplifies the architecture to minimize the number of provisioning changes required to build out end-to-end services.

Desktop Video: Enable multicast networking throughout the HQ Site Network and provision access between desktop VLAN segments to allow site-wide edge-to-edge IP video conferencing and IP TV services.

Year 5 – FY2011

Refresh: Technology refresh for the HQ Site Network during this phase will include upgrades to edge switches, distribution switches, and network routers.

Gig to the Desktop: Deliver Gigabit Ethernet network connectivity to the desktop for increased bandwidth enabling advanced applications on top of voice and video over IP convergence across a single network infrastructure.

Active/Active COOP: Complete all requirements to fully enable and support off-site DR/COOP requirements. Deploy load-balancing appliances configured in an

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active/active state where services can be operated simultaneously at both DOE HQ and at one or more off-site DR/COOP facilities (e.g. Sungurd, ESC-West, etc.).